



**Don Wilson**  
Vice President and  
General Manager

Certified Mail # 7011 1150 0001 2589 4542

July 6, 2017

United States, et.al. v. Valero, et.al.  
Civil Action No. SA-05-CA-0569  
May 5 – 18, 2017 Flaring Event  
Final Report

Director  
Air Enforcement Division (2242A)  
Office of Enforcement and Compliance Assurance  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, N.W.  
Washington, D.C. 20460

To Whom It May Concern:

Paragraph 242 of the Consent Decree between the United States and Valero requires the submission of a report within 60 days following the end of a flaring incident. The attached reports fulfill this obligation for a May 5 – 18, 2017 hydrocarbon flaring incident and a May 5 – 7, 2017 acid gas flaring incident that occurred at the Valero Benicia Refinery.

Please contact Sky Bellanca at (707) 745-7749 if you have any questions regarding this report.

Sincerely,

A handwritten signature in black ink that reads 'Donald C. Wilson'.

Donald C. Wilson  
Vice President & General Manager

DCW/KSB/tac

Enclosure

cc: Director, Air Division (AIR-1), Jordan.Deborah@EPA.gov  
Attn: Chief, Air Enforcement Office  
U. S. Environmental Protection Agency, Region 9  
75 Hawthorne Street  
San Francisco, CA 94105  
Certified Mail # 7011 1150 0001 2589 4559

ecc: Clare Sullivan Matrix New World Engineering Inc. - (csullivan@matrixnewworld.com)  
Don Cuffel, Director, Valero  
Kim Ronan, Manager, Valero



## Root Cause Failure Analysis

Impact Incident Number: 181596*The information contained below satisfies the requirements of the Valero Consent Decree XII.D.242*

Refinery: Benicia  
Incident Type: Tail Gas  
Combustion Source: Incinerators

Due Date: 7/6/2017  
Report Type: Final (Final, Initial or Follow-up)

Previous Dates and Reports: \_\_\_\_\_

(1.) The date and time that the Incident started and ended:

Times:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Start/End Date:	<u>5/5/2017</u>	<u>5/6/2017</u>	<u>5/7/2017</u>				
From:	<u>6:42 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>				
To:	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>12:59 PM</u>				
Total (Hrs):	<u>17.3</u>	<u>24.0</u>	<u>13.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>

(2.) Estimate of the quantity of SO<sub>2</sub> that was emitted:Tons of SO<sub>2</sub> = 21.2 tons **SEE ATTACHMENT 1 FOR CALCULATIONS**(3.) The steps taken to limit the duration and/or quantity of SO<sub>2</sub> emissions associated with the Incident:**A. Control House monitoring****B. The refinery implemented its emergency response procedures**

(4.) Detailed analysis that set forth the Root Cause of the Incident, to the extent determinable:

Pacific Gas and Electric (PG&E) had originally scheduled clearance of electrical lines that feed the Bahia Substation directly upstream of the Valero Benicia Refinery to occur in February 2017 during the refinery's turnaround to minimize potential impacts to the refinery; however, the work had to be rescheduled so PG&E could respond to a PG&E tower that was in danger of falling due to a mudslide along Hwy 24. On March 20, 2017, PG&E notified Valero that the rescheduled work could be completed on May 1, May 5, and May 8, 2017. These clearances did not require Valero to operate any equipment on the Valero-owned power distribution system.

The Bahia Substation is fed by two redundant, independent transmission lines (the Moraga and Vaca-Dixon lines) to ensure both primary and backup electrical power is available to the refinery. The Moraga line was scheduled to be cleared on May 1, 2017. During this scheduled clearance, the refinery would operate on power from the Vaca-Dixon line. That work was completed without incident on May 4, 2017. On May 5, 2017 the Vaca-Dixon line was scheduled to be cleared and the refinery would operate on power from the Moraga line.

After the power outage on May 5, 2017, Valero was informed that sometime prior to the early morning of May 5, 2017, a PG&E islanding/decoupling scheme (a control system) was already falsely alarmed due to a failed coupling capacitor voltage transformer (CCVT) (a metering device that provides the voltage signal). When PG&E opened the Vaca-Dixon transmission line breaker for the scheduled maintenance at approximately 6:40 am on Monday, May 5, 2017, the combination of the failed CCVT with the opening of the transmission line breaker caused the islanding/decoupling scheme to misoperate. The islanding/decoupling scheme then opened all circuit breakers feeding the refinery. The loss of both PG&E lines also forced Valero's Cogen offline, which is designed to occur in the event of a loss of PG&E power because Cogen's 47 MW rating is not sufficient to supply the 65 MW average demand of the refinery. As a result, a refinery-wide power outage occurred.

The sudden and unplanned loss of PG&E power caused an emergency shutdown of refinery equipment. Material in the equipment relieved to the flare to prevent accident, hazard, and release to atmosphere. Had it not been prevented by the actions taken, the damage to unit equipment could have escalated into an accident, hazard, and release to the atmosphere of incompletely combusted gases.

The loss of power occurred at 6:40 am and PG&E restored power to Valero's substation at some time before 7:00 am. Power in the refinery was restored at approximately 7:50 am, with the power distribution system not being completely normalized until around 3:00 pm, after all of the refinery substations were safely switched back to normal electrical lineup. Only at that point could the refinery units begin the process of restarting and resuming operation. Due to equipment damages caused from the abrupt shutdown of the refinery units and therefore the inability to properly clear equipment for a planned shutdown, the refinery was not able to immediately return to normal operations for over a month.

(5.) Analysis of the measures, if any, that are reasonably available to reduce the likelihood of a recurrence of the Incident including cost and effectiveness of changes in design, operation, and maintenance.

An ongoing, attorney-client privileged investigation with PG&E and Valero will identify any corrective action steps to reduce the likelihood of a recurrence.

(6.) Description of corrective action(s) or explanation of why corrective action(s) are not required:

Is corrective action required? No (Yes/No)**The flaring event was directly due to a sudden loss of uninterruptible power supply from PG&E.**

If corrective action(s) are not complete, what is the proposed schedule?

Start Date: \_\_\_\_\_

Completion Date: \_\_\_\_\_

(7.) Stipulated Penalty Analysis:

**SEE ATTACHMENT 2**

## Root Cause Failure Analysis

Impact Incident Number: 181596

(8.) The investigation of causes and/or possible corrective actions still are underway 60 days after the end of the incident so an extension is being requested (up to 60 days typically). Input a date only for initial and follow-up reports.

No (Yes/No)

The followup report shall be submitted by: \_\_\_\_\_

(9.) Is(are) the completion of the implementation of corrective action(s) finalized at this time?

NA (Yes/No/NA)

If no, a corrective action completion report is required within 30 days of completion.



# Root Cause Failure Analysis

Impact Incident Number: **181596**

## Certification (261)

"I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and that I have made a diligent inquiry of those individuals immediately responsible for obtaining the information and that to the best of my knowledge and belief, the information submitted herewith is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Signed: *Donald C. Wilson*  
Name: **Donald C. Wilson**

Date: 7-3-17  
Title: **Vice President and General Manager**

Submit copies to EPA, the applicable EPA regional office (242), and the applicable state agency (376).

## Attachment 1 - SO<sub>2</sub> Emission Calculations

(2.) Estimate of the quantity of SO<sub>2</sub> that was emitted:

Std. Temp: 68 deg.

AG, TG, or HC Flaring		TG Incineration	
Avg. Flowrate, dscfh (FR)	<b>6,173</b>	Incinerator Hourly Flowrate for hour i, dscfh	(FR <sub>Inc</sub> ) <sub>i</sub>
Total Duration (TD)	<b>54.3</b>	Hourly SO <sub>2</sub> Conc for hour i, ppmvd, 0% O <sub>2</sub>	(Conc SO <sub>2</sub> ) <sub>i</sub>
Avg. Vol. Fr. H <sub>2</sub> S, scf/scf (ConcH <sub>2</sub> S)	<b>0.763</b>	Hourly O <sub>2</sub> percent, dry for hour i	(%O <sub>2</sub> ) <sub>i</sub>
Tons of SO <sub>2</sub> =	<b>21.2</b>	24 hr excess SO <sub>2</sub> , lb	(ER <sub>TGI</sub> )
Tons of SO <sub>2</sub> = [FR][TD][ConcH <sub>2</sub> S][8.31 x 10 <sup>-5</sup> ]		Total hours of exceedance, hrs	(H <sub>TGI</sub> )
Tons of SO <sub>2</sub> = [6173][54.3][0.7628289][8.31 x 10 <sup>-5</sup> ]		$ER_{TGI} = \sum_{i=1}^{H_{TGI}} [FR_{Inc}]_i [Conc SO_2 - 250]_i [(20.9 - \%O_2)/20.9]_i [0.166 \times 10^{-6}]$	
Use this equation for TG flaring during maintenance of a monitored incinerator-adjust ConcH <sub>2</sub> S to show only the excess over allow H <sub>2</sub> S conc.-use best eng. judgment.		<b>SEE TABLE FOR CALCULATIONS</b>	
		Tons of SO <sub>2</sub> =	<b>0.0</b> tons

### Input Data for Tail Gas Incident at a Monitored Incinerator

Enter only block hours when CEMS average exceeded 250 ppm for 12-hour rolling average

If more than 24 hourly exceedances, add extra rows to the table as needed

Hour	Incinerator Exhaust Gas Flow Rate (FR <sub>Inc</sub> ) (dscfh)	SO <sub>2</sub> , ppmvd, O <sub>2</sub> free	O <sub>2</sub> Conc. (CEM data) (%)	Excess Emissions from Tail Gas at the SRP Incinerator (lbs SO <sub>2</sub> )
1				0.00
2				0.00
3				0.00
4				0.00
5				0.00
6				0.00
7				0.00
8				0.00
9				0.00
10				0.00
11				0.00
12				0.00
13				0.00
14				0.00
15				0.00
16				0.00
17				0.00
18				0.00
19				0.00
20				0.00
21				0.00
22				0.00
23				0.00
24				0.00

**Total: 0.00**

For SRPs not subject to NSPS, any exceedance of an SO<sub>2</sub> permit limit is a TG Incident (220(17)).

Include explanation of basis for any estimates of missing data points (257):

**Root Cause Failure Analysis**Impact Incident Number: 181596**Attachment 2 - Stipulated Penalty Analysis**Steps for Completing Stipulated Penalty Analysis

1. Evaluate criteria for stipulated penalties in sequential order from the top beginning with paragraph 250.a. At least one box in paragraphs 250, 251, or 252 must be marked "Yes". Boxes below the box marked "Yes", become "NA".
2. Provide a brief description where applicable.
3. Claim defenses in 253a., 253c., and 254 as applicable.

**Section XII: Paragraph 242.(7.) Statement for AG Flaring and Tail Gas Incidents**

<b><u>Section XII.F. Stipulated Penalty Criteria</u></b>	<b><u>Applies? (Yes/No)</u></b>	<b><u>Description/Basis</u></b>
<b><u>Paragraph 250 Criteria</u></b>		
250.a.	No	
250.b.	No	
250.c.	No	
<b><u>Paragraph 251 Criteria</u></b>		
251.a.	No	The flaring event was a direct result of the PG&E power outage. Due to equipment damages caused from the abrupt shutdown of the refinery units and therefore the inability to properly clear equipment, the refinery was not able to immediately return to normal operation. Venting to the Acid Gas Flare was discontinued as soon as it was feasible to do so.
251.b.	No	
<b><u>Paragraph 252 Criteria</u></b>		
252.a.	No	
252.b.	Yes	
252.c.	NA	
<b><u>Affirmative Defenses Claimed</u></b>		
253.a.	Yes	Loss of uninterruptible PG&E power supply directly caused the flaring event.
253.b.	Yes	
253.c. (251 does not apply)	Yes	
253.c. (malfunction)	No	
253.d.	No	
254	No	

## Root Cause Failure Analysis

Impact Incident Number: **181596**

*The information contained below satisfies the requirements of the Valero Consent Decree XII.D.242*

Refinery: Benicia  
Incident Type: Hydrocarbon Flaring  
Combustion Source: North and South Flare

Due Date: 7/17/2017  
**Final**

Previous Dates and Reports: \_\_\_\_\_

(1.) The date and time that the Incident started and ended:

Times:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Start/End Date:	<u>5/5/2017</u>	<u>5/6/2017</u>	<u>5/7/2017</u>	<u>5/8/2017</u>	<u>5/9/2017</u>	<u>5/10/2017</u>	<u>5/11/2017</u>
From:	<u>6:42 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>	<u>12:00 AM</u>
To:	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>11:59 PM</u>	<u>11:59 PM</u>
Total (Hrs):	<u>17.3</u>	<u>24.0</u>	<u>24.0</u>	<u>24.0</u>	<u>24.0</u>	<u>24.0</u>	<u>24.0</u>

After submittal of the Compliance Plan for Flaring Devices specified in 237, was the Incident attributable to the combustion of a stream(s) of Continuous or Intermittent Routinely-Generated Fuel Gases covered in the plan?

NA (Yes/No/NA)

If yes, it is not necessary to complete Sections 2-9.

If the flared gas contains less than 162 ppm H<sub>2</sub>S, it is not necessary to complete Sections 2-9.

(2.) Estimate of the quantity of SO<sub>2</sub> that was emitted:

Average Flowrate, dscfh (FR)	(FR)	<u>87,751</u>	Std. Temp: 68 deg.
Total Duration, hours	(TD)	<u>318.9</u>	
Avg. Vol. Frac. Total Sulfur, scf/scf	(ConcTS)	<u>0.006861</u>	
Tons of SO <sub>2</sub> =		<u>16.0</u>	
Tons of SO <sub>2</sub> = [FR][TD][ConcTS][8.31 x 10 <sup>-5</sup> ]			
Tons of SO <sub>2</sub> = [87751][318.9][0.006861][8.31 x 10 <sup>-5</sup> ]			

Include explanation of basis for any estimates of missing data points (257):

**The average flow rate and concentration of total sulfur are based on flare flow meter values and total sulfur CEMS.**

(3.) The steps taken to limit the duration and/or quantity of SO<sub>2</sub> emissions associated with the Incident:

**A. Control House monitoring**

**B. The refinery implemented its emergency response procedures**

Did the incident result from temporarily bypassing a flare gas recovery system for safety or maintenance reasons?

No (Yes/No)

If yes, it is not necessary to complete sections 3 or 5-9.



## Root Cause Failure Analysis

Impact Incident Number: **181596**

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(4.) Detailed analysis that set forth the Root Cause of the Incident, to the extent determinable:

Pacific Gas and Electric (PG&E) had originally scheduled clearance of electrical lines that feed the Bahia Substation directly upstream of the Valero Benicia Refinery to occur in February 2017 during the refinery's turnaround to minimize potential impacts to the refinery; however, the work had to be rescheduled so PG&E could respond to a PG&E tower that was in danger of falling due to a mudslide along Hwy 24. On March 20, 2017, PG&E notified Valero that the rescheduled work could be completed on May 1, May 5, and May 8, 2017. These clearances did not require Valero to operate any equipment on the Valero-owned power distribution system.

The Bahia Substation is fed by two redundant, independent transmission lines (the Moraga and Vaca-Dixon lines) to ensure both primary and backup electrical power is available to the refinery. The Moraga line was scheduled to be cleared on May 1, 2017. During this scheduled clearance, the refinery would operate on power from the Vaca-Dixon line. That work was completed without incident on May 4, 2017. On May 5, 2017 the Vaca-Dixon line was scheduled to be cleared and the refinery would operate on power from the Moraga line.

After the power outage on May 5, 2017, Valero was informed that sometime prior to the early morning of May 5, 2017, a PG&E islanding/decoupling scheme (a control system) was already falsely alarmed due to a failed coupling capacitor voltage transformer (CCVT) (a metering device that provides the voltage signal). When PG&E opened the Vaca-Dixon transmission line breaker for the scheduled maintenance at approximately 6:40 am on Monday, May 5, 2017, the combination of the failed CCVT with the opening of the transmission line breaker caused the islanding/decoupling scheme to misoperate. The islanding/decoupling scheme then opened all circuit breakers feeding the refinery. The loss of both PG&E lines also forced Valero's Cogen offline, which is designed to occur in the event of a loss of PG&E power because Cogen's 47 MW rating is not sufficient to supply the 65 MW average demand of the refinery. As a result, a refinery-wide power outage occurred.

The sudden and unplanned loss of PG&E power caused an emergency shutdown of refinery equipment. Material in the equipment relieved to the flare to prevent accident, hazard, and release to atmosphere. Had it not been prevented by the actions taken, the damage to unit equipment could have escalated into an accident, hazard, and release to the atmosphere of incompletely combusted gases.

The loss of power occurred at 6:40 am and PG&E restored power to Valero's substation at some time before 7:00 am. Power in the refinery was restored at approximately 7:50 am, with the power distribution system not being completely normalized until around 3:00 pm, after all of the refinery substations were safely switched back to normal electrical lineup. Only at that point could the refinery units begin the process of restarting and resuming operation. Due to equipment damages caused from the abrupt shutdown of the refinery units and therefore the inability to properly clear equipment for a planned shutdown, the refinery was not able to immediately return to normal operations for over a month.

Was the incident attributable to the SU/SD of a unit in which a similar Incident was previously analyzed for corrective action?

No (Yes/No)

If yes, it is not necessary to complete Sections 5-9 if the corrective action is identified.

Has a commitment been made in the Compliance Plan for Flaring Devices to process this stream in a planned flare gas recovery system that would have reduced the SO<sub>2</sub> emissions for this incident to less than 500 lbs in a 24 hour period?

No (Yes/No)

If yes, it is not necessary to complete Sections 5-9.

(5.) Analysis of the measures, if any, that are reasonably available to reduce the likelihood of a recurrence of the Incident including cost and effectiveness of changes in design, operation, and maintenance.

**An ongoing, attorney-client privileged investigation with PG&E and Valero will identify any corrective action steps to reduce the likelihood of a recurrence.**

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(6.) Description of corrective action(s) or explanation of why corrective action(s) are not required:

Is corrective action required? No (Yes/No)

**The flaring event was directly due to a sudden loss of uninterruptible power supply from PG&E.**

If corrective action(s) are not complete, what is the proposed schedule?

Start Date: \_\_\_\_\_

Completion Date: \_\_\_\_\_

(7.) Stipulated Penalty Analysis:

**NOT APPLICABLE**



## Root Cause Failure Analysis

Impact Incident Number: 181596

(8.) The investigation of causes and/or possible corrective actions still are underway 60 days after the end of the incident so an extension is being requested (up to 60 days typically). Input a date only for initial and follow-up reports.

No (Yes/No)

The followup report shall be submitted by: \_\_\_\_\_

Alternatively, HC Flaring RCFA reports may be submitted as part of Semi-annual Progress Reports (243).

(9.) Is(are) the completion of the implementation of corrective action(s) finalized at this time?

NA (Yes/No/NA)

If no, a corrective action completion report is required within 30 days of completion.

### **Certification (261)**

"I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and that I have made a diligent inquiry of those individuals immediately responsible for obtaining the information and that to the best of my knowledge and belief, the information submitted herewith is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Signed: \_\_\_\_\_

Name: Donald C. Wilson

Date: 7/3/17

Title: Vice President and General Manager

Submit copies to EPA, the applicable EPA regional office (242), and the applicable state agency (376).

NOTE: Prior to the NSPS compliance date for flaring devices, a single RCFA report may be prepared for HC Flaring Incidents with root causes that routinely reoccur provided EPA and the appropriate Plaintiff-Intervener have been given prior notification. (244)



181596

Times:	Start/End Date:	From:	To:	Total (Hrs):
8	5/12/2017	12:00 AM	11:59 PM	24.0
9	5/13/2017	12:00 AM	11:59 PM	24.0
10	5/14/2017	12:00 AM	11:59 PM	24.0
11	5/15/2017	12:00 AM	11:59 PM	24.0
12	5/16/2017	12:00 AM	11:59 PM	24.0
13	5/17/2017	12:00 AM	11:59 PM	24.0
14	5/18/2017	12:00 AM	1:38 PM	13.6
15				0.0
16				0.0
17				0.0
18				0.0
19				0.0
20				0.0
21				0.0
22				0.0
23				0.0
24				0.0
25				0.0
26				0.0
27				0.0



